Table 12.2 Information Elements of a File Directory

Basic Information	
File Name	Name as chosen by creator (user or program). Must be unique within a specific directory.
File Type	For example: text, binary, load module, etc.
File Organization	For systems that support different organizations
Address Information	
Volume	Indicates device on which file is stored
Starting Address	Starting physical address on secondary storage (e.g., cylinder, track, and block number on disk)
Size Used	Current size of the file in bytes, words, or blocks
Size Allocated	The maximum size of the file
Access Control Information	
Owner	User who is assigned control of this file. The owner may be able to grant/deny access to other users and to change these privileges
Access Information	A simple version of this element would include the user's name and password for each authorized user.
Permitted Actions	Controls reading, writing, executing, transmitting over a network
Usage Information	
Date Created	When file was first placed in directory
Identity of Creator	Usually but not necessarily the current owner
Date Last Read Access	Date of the last time a record was read
Identity of Last Reader	User who did the reading
Date Last Modified	Date of the last update, insertion, or deletion
Identity of Last Modifier	User who did the modifying
Date of Last Backup	Date of the last time the file was backed up on another storage medium
Current Usage	Information about current activity on the file, such as process or processes that have the file open, whether it is locked by a process, and whether the file has been updated in main memory but not yet on disk

Table 12.4 Information in a UNIX Disk-Resident Inode

File Mode 16-bit flag that stores access and execution permissions associated with the file.

12-14	File type (regular, directory, character or block special, FIFO pipe
9-11	Execution flags
8	Owner read permission
7	Owner write permission
6	Owner execute permission
5	Group read permission
4	Group write permission
3	Group execute permission
2	Other read permission
1	Other write permission
0	Other execute permission

Link Count Number of directory references to this inode

Owner ID Individual owner of file

Group ID Group owner associated with this file

File Size Number of bytes in file

File Addresses 39 bytes of address information

Last Accessed Time of last file access

Last Modified Time of last file modification

Inode Modified Time of last inode modification

Table 12.5 Capacity of a UNIX File

Level	Number of Blocks	Number of Bytes
Direct	10	10K
Single Indirect	256	256K
Double Indirect	$256 \times 256 = 65K$	65M
Triple Indirect	$256 \times 65K = 16M$	16G

Table 12.6   Windows NTFS Partition and Cluster Sizes

Volume Size	Sectors per Cluster	Cluster Size
512 Mbyte	1	512 bytes
512 Mbyte - 1 Gbyte	2	1K
1 Gbyte - 2 Gbyte	4	2K
2 Gbyte - 4 Gbyte	8	4K
4 Gbyte - 8 Gbyte	16	8K
8 Gbyte - 16 Gbyte	32	16K
16 Gbyte - 32 Gbyte	64	32K
> 32 Gbyte	128	64K

Table 12.7 Windows NTFS File and Directory Attribute Types

Attribute Type	Description
Standard information	Includes access attributes (read-only, read/write, etc.); time stamps, including when the file was created or last modified; and how many directories point to the file (link count).
Attribute list	A list of attributes that make up the file and the file reference of the MFT file record in which each attribute is located. Used when all attributes do not fit into a single MFT file record.
File name	A file or directory must have one or more names.
Security descriptor	Specifies who owns the file and who can access it.
Data	The contents of the file. A file has one default unnamed data attribute and may have one or more named data attributes.
Index root	Used to implement folders.
Index allocation	Used to implement folders.
Volume information	Includes volume-related information, such as the version and name of the volume.
Bitmap	Provides a map representing records in use on the MFT or folder.

Note: shaded rows refer to required file attributes; the other attributes are optional.